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Finance Research Letters

DOI:
https://doi.org/10.1016/j.frl.2020.101887

Published: 01/10/2021

Peer reviewed version

A New Measure for Gauging the Riskiness of European Banks' Sovereign Bond Portfolios

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Abstract

For a sample of large European banks, during 2010-2016, we construct a novel measure (SovRisk) which captures the riskiness of sovereign bond portfolios. We demonstrate the ability of this measure to explain the different phases of the European sovereign debt crisis, while accounting for the substantial differences among distressed and non-distressed countries. We contend that SovRisk can be used as complement to bank Credit Default Swap (CDS) spreads, or a substitute in the absence of traded CDS, for measuring banks' sovereign risk.

Word count: 2,561

Keywords: Bank sovereign risk exposure; Sovereign bond portfolios; Sovereign-bank nexus.
JEL classification: G01; G21; G28.

1. Introduction

The sovereign-bank nexus attracted widespread attention during the European sovereign debt crisis. The strong interconnection between bank and sovereign risk, especially for institutions operating in distressed euro area countries, renewed the focus on the prudential treatment of banks' sovereign bond holdings. This was of policy importance for both financial stability and monetary policy concerns. Notable contributions (Acharya et al., 2014; Farhi and Tirole, 2017, among others) document the existence of multiple risk transmission channels feeding the two-way vicious loop between banks and sovereigns. Framed within the current debate on how to successfully reduce risk in European banking and complete the post-crisis reform agenda, an accurate appreciation of the inherent riskiness of banks' sovereign bond portfolios is of primary importance.

While an extensive strand of prior literature has focused on investigating the determinants of both size and risk of banks' sovereign debt exposures in Europe (Acharya and Steffen, 2015; Ongena et al., 2019), limited attention has been devoted to develop a quantitative measure to quantify the risk associated with these exposures. Previous empirical studies mostly employ CDS spreads to assess the riskiness of both sovereigns and banks and the associated sovereign-bank nexus in Europe (Acharya et al., 2014; Fratzscher and Rieth, 2019, among others). However, although the widespread use of spreads on CDS contracts as proxies for default risk, a number of authoritative contributions (Annaert et al., 2013; Avino and Cotter, 2014; Fontana and Scheicher, 2016) underline significant challenges in using these indicators. In a nutshell, especially in periods of significant distress, CDS spreads tend to capture wider market dynamics, thereby failing in solely grasping banks' debt riskiness.

In this paper, we create a novel and alternative indicator, SovRisk, which focuses on weighted country-by-country banks' sovereign bond exposures and links them with the specific risk profile of each selected country. Our measure, which consists of two key components that capture (i) a bank's exposure towards a specific sovereign and (ii) the actual risk of such exposure, is believed to mitigate the controversial effect of wider market dynamics, compared to CDS spreads, while effectively measuring the overall riskiness of a bank's sovereign debt portfolio. Moreover, while CDS spreads are available mostly for large listed banks, by linking accounting to market-based information, SovRisk can be employed to

investigate the sovereign risk exposure for wider samples of banks. For 51 large banks from 19 European countries, we construct SovRisk on the basis of a publicly available and granular dataset from the European Banking Authority (EBA).[1] We consider a time frame that covers both a distressed (namely, the European sovereign debt crisis, started in late 2009) and a more tranquil period, following the ECB's intervention, in mid-2012, to prevent the collapse of the euro area.

We test the reliability of SovRisk in several ways. First, we test its capability to capture the different phases of sovereign default risk that characterised the European context during 2010-2016. Specifically, we explore whether banks located in stressed (Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain) and non-stressed countries, with heterogenous financial and fiscal conditions, present different risk exposures in their sovereign bond portfolios.[2] Second, we check whether the trend of SovRisk is similar to that of bank CDS spreads. Finally, in a regression-setting, we explore the relationship between SovRisk and both bank-specific and macroeconomic factors and compare the results to both the evidence for bank CDS spreads and prior literature on bank exposure to sovereign distress in Europe.

2. Empirical methodology and data

SovRisk for a bank *i* at time *t* is defined as follows:

$$SovRisk_{it} = \sum_{j=1}^{19} Spread_{jt} * Sovexpcountry_{ijt}$$

where:

$$Spread_{jt} = 1 + (10Y\ sovereign\ bond\ yield_{jt} - Benchmark_t)$$

and:

$$Sovexpcountry_{ijt} = Sovexp_{ijt}/Bankotass_{it}$$

$Spread_{jt}$ is the spread between the 10-year yield on a sovereign bond for a country *j* at time *t* and the 10-year German bund, as a benchmark. $Sovexpcountry_{jt}$ is the weighted sovereign

[1] The sample includes banks that were subject to either the EBA EU-wide stress tests or transparency exercises during 2010-2016. Table A1 in the Appendix reports the list of banks included in the sample.

[2] Stressed countries, compared to non-stressed countries, were perceived as having higher sovereign default and liquidity risks during the European sovereign debt crisis (Altavilla et al., 2017; Wei et al., 2018). European non-stressed countries are: Austria, Belgium, Denmark, Germany, Finland, France, Hungary, Luxembourg, Malta, Netherlands, Poland, Sweden and United Kingdom.

exposure of bank *i* towards each country *j* at time *t*. The higher the value of *SovRisk*, the higher the risk of the corresponding bank sovereign bond portfolio.

In a second stage of our analysis, we employ the System-Generalised Method of Moments (S-GMM) estimator, two-step procedure, in order to account for the potential endogeneity of the determinants of banks' sovereign bond holdings (Gennaioli et al., 2018; Affinito et al., 2019). The econometric equation is specified as follows:

$$Y_{it} = \alpha + \beta_0 Y_{it-1} + \beta_1 X_{it-1} + \beta_2 Z_{it} + \mu_t + \varepsilon_{it} \quad (1)$$

Y_{it} is our dependent variable (SovRisk or, alternatively, the logarithm of bank CDS spreads) for bank *i* at time *t*.[3] Y_{it-1} is the lagged value of the dependent variable, included to control for time persistence. Vector X comprises a set of lagged bank-specific variables, commonly employed in banking literature (e.g. Gennaioli et al., 2018; Affinito et al., 2019), as proxies for bank size (Size), loans outstanding (Lending), non-performing loans (NPLs), capitalisation (CET1), profitability (ROE), liquidity (Liquidity), business model orientation (Business model) and solvency (Z-score). Vector Z consists of exogenous country-level factors, such as short-term interest rates (STrate), the amount of sovereign debt (SovDebt) and GDP growth (GDP), able to influence banks' preference to purchase sovereign bonds. Year fixed-effects (μ_t) are included. Robust standard errors, corrected according to Windmeijer (2005), are clustered at bank level.

3. Results

Figure 1 shows the development of the average value of SovRisk, for the entire sample of banks, during 2010-2016. SovRisk effectively captures the different phases of the European sovereign debt crisis (the right hand side of Figure 1). It peaks during the most acute phase of the crisis, in 2012, driven by a contemporaneous increase in banks' amount and riskiness of sovereign bond holdings, to then decrease afterwards. In addition, when splitting the sample between stressed and non-stressed European countries, SovRisk reveals a similar trend. However, its magnitude differs substantially during 2010-2016, with stressed banks holding larger and riskier amounts of sovereign debt compared to non-stressed banks.[4]

[3] We employ bank 5Y senior CDS contracts collected from Datastream.

[4] T-test of mean differences indicates that SovRisk stressed and SovRisk non-stressed means are statistically different from zero at the 5% level.

In order to provide further evidence on the reliability of our metric, we conduct a visual comparison of the trends for the average values of SovRisk and bank CDS spreads. The test is based on a restricted sample of 33 banks, depending on the availability for CDS data (Figure 2). During 2010-2014, inclusive of the most acute phase of the European sovereign debt crisis, the related trends appear to be similar for both the stressed and non-stressed sub-groups.[5]

The findings for the S-GMM, as displayed in Table 1, demonstrate similarities between the main determinants of SovRisk (column 1) and bank CDS spreads (column 2). Furthermore, in-line with prior literature on bank exposure to sovereign distress, our results highlight an inverse relationship between Size and SovRisk, statistically significant at the 1% level. Smaller banks tend to hold riskier sovereign bonds (Altavilla et al., 2017). The lending variable exhibits a negative relation with SovRisk, statistically significant at the 5% level. Banks that either face lending constrains or limited demand for loans might have an incentive to buy more and riskier amounts of sovereign debt in order to support profitability (Acharya et al., 2015, Altavilla et al., 2017). Finally, banks with lower amounts of NPLs tend to increase the riskiness of their sovereign bond holdings, likely because they are subject to less operational constraints. Among the macroeconomic variables, we find that banks located in countries with larger amounts of sovereign debt (to GDP) are more prone to hold riskier sovereign bonds. This evidence might be driven by the greater "home-bias" of the sovereign bond portfolios of stressed banks.

4. Conclusions

We construct a novel measure (SovRisk) to assess the riskiness of European banks' sovereign bond portfolios. We test its capability to capture the various phases of the European sovereign debt crisis, for both stressed and non-stressed banks. When compared with CDS spreads, we argue that SovRisk represents a reliable indicator of the banks' sovereign risk exposure, which can also be employed in the absence of traded bank CDS. Finally, we find the results of our dynamic panel data regression to be consistent with prior literature on banks' exposure to sovereign risk in Europe, as well as with the evidence for bank CDS spreads.

[5] From 2015, for stressed banks, the trends start to diverge. We argue that the introduction of the EU Bank Recovery and Resolution Directive (BRRD), and associated bail-in mechanism, is likely to have played an important role in this evidence.

References

Acharya, V., Drechsler, I., Schnabl, P. 2014. A pyrrhic victory? Bank bailouts and sovereign credit risk. *Journal of Finance* 69, 2689-2739.

Acharya, V., Steffen, S. 2015. The "greatest" carry trade ever? Understanding Eurozone bank risk. *Journal of Financial Economics* 115, 215-236.

Affinito, M., Albareto, G., Santioni, R. 2019. Purchases of sovereign debt securities by banks during the crisis: The role of balance sheet conditions. *Journal of Banking and Finance*, 105575.

Altavilla, C., Pagano, M., Simonelli, S. 2017. Bank exposures and sovereign stress transmission. *Review of Finance*, 21, 2103-2139.

Annaert, J., De Ceuster, M., Van Roy, P., Vespro, C. 2013. What determines Euro area bank CDS spreads? *Journal of International Money and Finance*, 32, 444-461.

Avino, D., Cotter, J. 2014. Sovereign and bank CDS spreads: Two sides of the same coin? *Journal of International Money and Finance*, 32, 72-85.

Farhi, E., Tirole, J. 2017. Deadly embrace: Sovereign and financial balance sheets doom loops. *The Review of Economic Studies*, 85, 1781-1823.

Fontana, A., Scheicher, M. 2016. An analysis of euro area sovereign CDS and their relation with government bonds. *Journal of Banking and Finance*, 62, 126-140.

Fratzscher, M., Rieth, M. H. 2019. Monetary policy, bank bailouts and the sovereign-bank risk nexus in the euro area. *Review of Finance*, 23, 745-775.

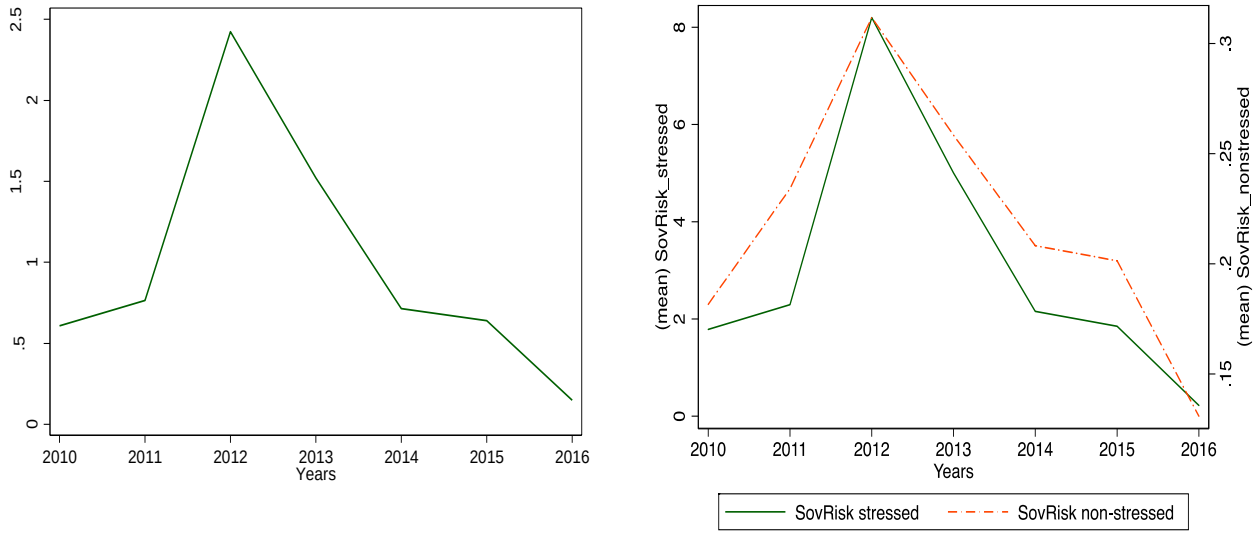
Gennaioli, N., Martin, A., Rossi, S. 2018. Banks, government bonds, and default: What do the data say? *Journal of Monetary Economics*, 98, 98-113.

Ongena, S., Popov, A., Van Horen, N. 2019. The invisible hand of the government: Moral hazard suasion during the European Sovereign Debt Crisis. *American Economic Journal: Macroeconomics*, 11, 346-379.

Wei, Y., Hamill, P., Youwei, L., Vigne, S. A., Waterworth, J. 2018. An analysis of liquidity skewness for European sovereign bond markets. *Finance Research Letter*, 26, 274-280.

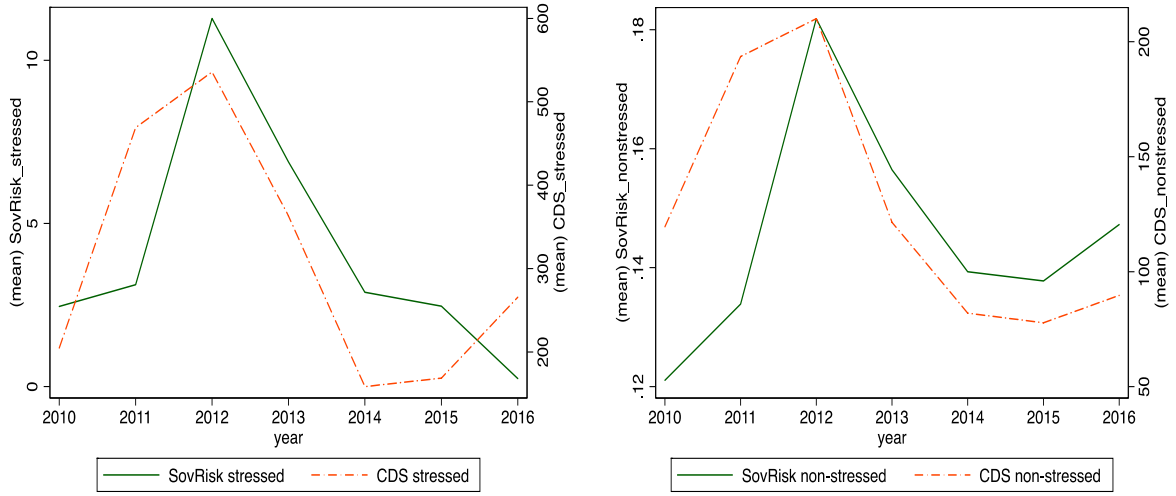
Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126, 25-51.

Figure 1. Development of SovRisk, 2010-2016.



Note: On the left refers the average value of SovRisk for the whole sample, whilst on the right the average value of SovRisk for stressed (green line, left y axis) and non-stressed (dashed red line, right y axis) countries.

Figure 2. Development of SovRisk and bank CDS spreads, 2010-2016.



Note: On the left refers the average value of SovRisk (green line, left y axis) and bank CDS spreads (dashed red line, right y axis) for stressed countries, whilst on the right the average value of SovRisk (green line, left y axis) and bank CDS spreads (dashed red line, right y axis) for non-stressed countries.

Table 1. Riskiness of banks' sovereign bond portfolios (S-GMM), 2010-2016.

	(1) SovRisk	(2) Bank CDS spreads
$SovRisk_{t-1}$	0.2778***	
	(0.1242)	
$Bank\ CDS\ spreads_{t-1}$		0.6500**
		(0.0665)
$Size_{t-1}$	-0.0409***	-0.0577***
	(0.0098)	(0.0212)
$Lending_{t-1}$	-0.0016**	-0.0010
	(0.0007)	(0.0018)
$NPLs_{t-1}$	-0.0030***	-0.0089***
	(0.0009)	(0.0023)
$CET1_{t-1}$	-0.0337	-0.7907
	(0.4271)	(0.9457)
ROE_{t-1}	-0.0006	-0.0062**
	(0.0010)	(0.0010)
$Liquidity_{t-1}$	-0.0006	-0.0323
	(0.0020)	(0.0028)
$Business\ model_{t-1}$	-0.0005	0.0217***
	(0.0024)	(0.0083)
Z-score	-0.0002	-0.0099**
	(0.0031)	(0.0031)
STrate	0.0214	0.0210
	(0.0216)	(0.0499)
SovDebt	0.0028***	0.0001
	(0.0006)	(0.0007)
GDP	-0.0009	0.0005
	(0.0028)	(0.0036)
N. Obs.	304	192
N. Banks	51	32
AR2 Test	0.256	0.299
Hansen Test	0.135	0.167
N. Instruments	32	32
Year Fe	Yes	Yes

Note: Corrected robust standard errors are clustered at bank level and reported in parentheses. The p-values for the Arellano and Bond test for second order autocorrelation in the residuals (AR2), as well as the p-value for the Hansen J test are reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Appendix

Table A1. Sample of banks

#	Bank	Country
1	Erste Group Bank AG	AT
2	KBC Groep NV/ KBC Groupe SA-KBC Group	BE
3	Bank of Cyprus Public Company Limited-Bank of Cyprus Group	CY
4	Bayerische Landesbank	DE
5	Commerzbank AG	DE
6	DekaBank Deutsche Girozentrale AG	DE
7	Deutsche Bank AG	DE
8	HSH Nordbank AG	DE
9	Hypo Real Estate Holding AG	DE
10	Landesbank Baden-Wuerttemberg	DE
11	Landesbank Hessen-Thueringen Girozentrale - HELABA	DE
12	Norddeutsche Landesbank Girozentrale NORD/LB	DE
13	Danske Bank A/S	DK
14	Jyske Bank A/S (Group)	DK
15	Nykredit Realkredit A/S	DK
16	Sydbank A/S	DK
17	Banco Bilbao Vizcaya Argentaria SA-BBVA	ES
18	Banco Popular Espanol SA	ES
19	Banco Santander SA	ES
20	OP Financial Group	FI
21	BNP Paribas	FR
22	BPCE SA	FR
23	Crédit Agricole S.A.	FR
24	Société Générale SA	FR
25	Barclays Bank Plc	GB
26	HSBC Holdings Plc	GB
27	Lloyds Banking Group Plc	GB
28	Royal Bank of Scotland Group Plc (The)	GB
29	OTP Bank Plc	HU
30	AIB Group PLC	IE
31	Bank of Ireland-Governor and Company of the Bank of Ireland	IE
32	Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena	IT
33	Banco Popolare società cooperativa	IT
34	Intesa Sanpaolo	IT
35	UniCredit SpA	IT
36	Unione di Banche Italiane Scpa-UBI Banca	IT
37	Banque et Caisse d'Epargne de l'Etat Luxembourg	LU
38	Bank of Valletta Plc	MT
39	ABN AMRO Group N.V.	NL
40	ING Groep NV	NL
41	SNS Holding	NL
42	Powszechna Kasa Oszczednosci Bank Polski SA - PKO BP SA	PL
43	Banco BPI SA	PT
44	Banco Comercial Português, SA-Millennium bcp	PT
45	Caixa Geral de Depositos	PT
46	Nordea Bank AB (publ)	SE
47	Skandinaviska Enskilda Banken AB	SE
48	Svenska Handelsbanken AB	SE
49	Swedbank AB	SE
50	NLB dd-Nova Ljubljanska Banka d.d.	SI
51	Nova Kreditna Banka Maribor d.d.	SI

Note: The table reports the list of 51 banks included in the whole sample, as well as their respective country ISO-code.